

CSHD 148 – Fall 2025

Physiology of Human Development

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Tuesday & Thursday 10:30 - 11:45
Lane 100, Tufts University

Overview. The goal of this course is to understand how children's physiological responses are shaped in part by their environmental experiences and in turn play a role in shaping their development. We will discuss how physiology plays a role in children's adaptation and coping when faced with stressors ranging from macro (e.g., family or neighborhood violence, discrimination) to the micro levels (e.g., family or peer conflict) to small challenging daily tasks (e.g., a challenging puzzle or test in school). We will also emphasize the role that physiology plays in thriving and "resilience" (i.e., positive adaptation in the face of challenges) and response to positive environmental experiences (e.g., responsive parent-child relationships). We will use a developmental lens that investigates longitudinal change over time (e.g., how children's response to the environment changes as they encounter puberty) and individual differences between children (e.g., cultural variation within and across communities in the US and beyond).

Student Learning Goals: *By the end of this course, I want you to be able to....*

1. Understand children's physiological systems (ANS, HPA axis, inflammation) and how to measure them
2. Explain how children's physiology responds to experiences at family, school, neighborhood, and societal levels
3. Explain the role of physiology for children's learning, emotions and behavior
4. Understand cross-context differences and equity issues in physiological research
5. Read, interpret, and critique empirical studies on children's physiology
6. Design a novel research study on children's physiology
7. Apply these concepts to real-world events and your future careers

Office hours: Office hours are available 9:30am - 10:30 am Tuesdays Eliot Pearson Room 105 in person or on Zoom. Email to let me know you will come.

Participation: Class attendance and participating is important for this course because we will do many hands-on learning activities. Your participation is marked using the "ticket in" and "ticket out" assignments (see details below). You will automatically have two excused absences. Use of cell phones in class is discouraged except in emergencies, because research consistently demonstrates it distracts both the user and other students from learning. By attending every class and actively engaging in class activities, you and your peers will be able to learn most effectively.

Readings: You are expected to read for each class. [You can use these guiding reading questions.](#) Take notes while you read. Taking notes will help you to process the

information and identify key takeaways. Without taking notes, it is very difficult to retain key concepts and information. Research shows that the process of handwriting notes, especially, helps you to remember the material. The notes should not be more than one page per day. [Read these strategies for reading academic articles.](#)

Student feedback: I value your feedback and actively want it so I can improve my teaching - which I care about deeply. You may give feedback on the course at any time via (1) verbally to me (2) email to me (3) [this anonymous google form](#) (4) by emailing heather.dwyer@tufts.edu who will send it to me anonymously.

Course Assignments Details:

“Tickets In” to Class. On designated “ticket days” (see schedule days marked with ) , class begins with 1–2 reflection questions on that day’s assigned reading materials. **Purpose:** These reflections help you with accountability for readings, especially to: review and articulate key ideas, prepare to contribute in group work, and create notes to reference later. The questions focus on big-picture concepts not memorization of small details. **How It Works:** At the start of class, a question will be on the slide. You’ll have ~3 minutes to submit your response via [Google Form](#) (same link each time). Students are not allowed to use reading notes: this is memory recall practice. The Honor system applies; you will sign an honor pledge before answering the question. **Grading (0–2 points):** You will be graded for each ticket as: 0 = missing/incomplete or clearly guessed; 1 = superficial/partial answers; 2 = thoughtful answer that shows understanding. There are 22 ticket days, but only 20 points count - you get 2 free absences (for illness, travel, etc.). **Even if you’re sick and I understand why you’re absent, I cannot give you credit for more than 2 tickets that you are absent.** This is because the intention is to give you credit for participating in class. There is no extra credit for completing all tickets. The same applies to the tickets out (see below).

 **“Ticket Out” of Class.** On “ticket days,” students submit a brief reflection at the end of class (via the same form). You’ll have ~3 minutes to note key takeaways in full sentences or bullet points. **Grading:** Tickets out are graded for engagement (0–1 point), using the same scale as “ticket in.” Again, only 2 absences are excused; additional missed tickets result in lost points, even if excused. Up to 2 points per “ticket day” (1 in + 1 out), designed to reinforce learning, boost retention, and support class participation.

Research Proposal. Students will have an opportunity to expand their own research interests by identifying a novel research question(s) that extends our understanding of specific developmental, psychological, or educational processes by examining its links to human physiology/stress reactivity in a meaningful way. Specifically, they will write a brief proposal for a novel study that measures children’s stress physiology and how it is related to their environmental experiences, learning and behavior, or both. In addition, students will give a 15- minute presentation on the topic of their proposal on the due date. [More details about these assignments here.](#)

Grading: Course grades are based on the assignments & quizzes listed in the table

below. All assignments must be submitted before the due date and time. I use a transparent grading rubric for all assignments and for all course grades, so that expectations and evaluation metrics are clear. [You can see that rubric here.](#) Score yourself and improve your work before I grade it. You can receive up to 200 points for the course. I will calculate this into a final % and use corresponding letter grades below:

99 - 100%	A+	88 - 89%	B+	78 - 79%	C+	68 - 69%	D+
94 - 98%	A	84 - 87%	B	74 - 77%	C	64 - 67%	D
90 - 93%	A-	80 - 83%	B-	70 - 73%	C-	60 - 63%	D-

Assignment	Brief Description	Points	Due Date	Submission
Class day assignments (80 points total)				
"Ticket in" to class	2 questions about the assigned materials for class	40 (2 points each for 20 classes)	Daily at start of class	Google Form
"Ticket out" of class	2 questions about the class itself	40 points (2 points each for 20 classes)	Daily at end of class	Google Form
Research Proposal (120 points total) More details about these assignments here				
Measure proposal	Pick a physiological measure of interest for your study	25	Oct 9	On canvas
Research Proposal Draft 1	Propose a study that measures children's stress physiology	25	Nov 4	On canvas
Peer feedback	Provide peer feedback on research proposal	15	Nov 6	On canvas
Proposal Final Draft	Revise your study based on feedback	25	Dec 2	On canvas
Student presentation	Present your research proposal (5 min, + 5 min discussion)	30	Dec 2	In person

COURSE SCHEDULE

[Guiding Reading Questions linked here](#)

PART 1 - Starting with the “why”

Class 1 - Tuesday, September 2

INTRODUCTION TO THIS CLASS

- Please read this syllabus carefully

Class 2 - Thursday, September 4 - #1

INTRODUCTION TO PHYSIOLOGY OF HUMAN DEVELOPMENT

- Armstrong-Carter (2022) What is stress physiology and how can it add to our understanding of children’s development? *This has some duplicate info, but I think it is useful to read both. This first reading is less advanced than the second.*
- [Armstrong-Carter, Portilla, Obradovic \(2024\) The Role of Physiological Response in Understanding Resilience Processes in Children’s Development](#)

Class 3 - Tuesday, September 9 - #2

BIOLOGICAL EMBEDDING & ALLOSTATIC LOAD

- Shonkoff, Boyce, & McEwen, (2009). Neuroscience, molecular biology, and the childhood roots of health disparities: Building a new framework for health promotion and disease prevention. JAMA.
- [Megan Gunnar’s talk on Biological Embedding and Adaptive Calibration](#)
- OPTIONAL: Brody, Yu, Chen, Miller, Kogan, & Beach (2013). Is resilience only skin deep? Rural African Americans’ socioeconomic status–related risk and competence in preadolescence and psychological adjustment and allostatic load at age 19. Psychological science.

Class 4 - Thursday, September 11 - #3

ADAPTIVE CALIBRATION MODEL

- EXCERPT: Ellis, Giudice & Shirtcliff (2017). The adaptive calibration model of stress responsivity: Concepts, findings, and implications for developmental psychopathology. Child and Adolescent Psychopathology, Third Edition. Read until page 7 “functions of stress response systems”

Part 2 - Physiological systems

Class 5 - Tuesday, September 16 - #4

SALIVARY CORTISOL

- Gunnar (2021). Forty years of research on stress and development: What have we learned and future directions. American Psychologist, 76(9),

Class 6 - Thursday, September 18 - #5

HAIR CORTISOL

- Bates, Salsberry, & Ford (2017). Measuring stress in young children using hair cortisol: The state of the science. Biological research for nursing.

Class 7 - Tuesday, September 23 - 📖 #6

PARASYMPATHETIC NERVOUS SYSTEM PART 1

- EXCERPT ON POLYVAGAL THEORY: El-Sheikh et al., (2009). Marital conflict and children's externalizing behavior: Pathways involving interactions between parasympathetic and sympathetic nervous system activity. Monographs of the Society for Research in Child Development.

Class 8 - Thursday, September 25 - 📖 #7

PARASYMPATHETIC NERVOUS SYSTEM PART 2

- [Video on polyvagal theory](#)
- Optional: Porges (2022) polyvagal theory, the science of safety.

Class 9 - Tuesday, September 30 - 📖 #8

SYMPATHETIC NERVOUS SYSTEM PART 1

- EXCERPT ON SNS: El-Sheikh et al., (2009). Marital conflict and children's externalizing behavior: Pathways involving interactions between parasympathetic and sympathetic nervous system activity.

Class 10 - Thursday, October 2 - WORKSHOP #1 - 📖 #9

WORK ON MEASURES PROPOSAL

- [Read assignment details](#)

Class 11 - Tuesday, October 7 - 📖 #10

SYMPATHETIC NERVOUS SYSTEM PART 2

- No reading - review reading from SNS part 1
- Work on your measures proposal

**Class 12 - Thursday October 9 - 📖 #11 - MEASURES PROPOSAL DUE
INFLAMMATION**

- Kuhlman, Horn, Chiang, & Bower, (2020). Early life adversity exposure and circulating markers of inflammation in children and adolescents: A systematic review and meta-analysis. *Brain, behavior, & immunity*.

PART 3: Developmental periods & processes

CLASS 13 - Tuesday, October 14 - WORKSHOP #2 - 📖 #12

- To prepare for class, read your peer's proposal and jot down notes to discuss
- In class, we will exchange preliminary feedback and work on research proposal

Class 14 - Thursday, October 16 - 📖 #13

THE PRENATAL PERIOD

- Nolvi, Merz, Kataja, & Parsons (2023). Prenatal stress and the developing brain: postnatal environments promoting resilience. *Biological psychiatry*.
- *Optional video:* [Baby's First Years and the Impact of Cash Support for Low-Income Families on Infant Brain Activity](#)

Class 15 - Tuesday, October 21 - 📖 #14

PARENTS, FAMILIES & ROUTINES

- Obradović (2016). Physiological responsivity and executive functioning: Implications for adaptation and resilience in early childhood. *Child Development Perspectives*.
- Gunnar (2017). Social buffering of stress in development: A career perspective. *Perspectives on Psychological Science*.

Class 16 - Thursday, October 23 - #15

SLEEP, NUTRITION AND EXERCISE

- Fuligni, Chiang & Tottenham (2021). Sleep disturbance and the long-term impact of early adversity. *Neuroscience & Biobehavioral Reviews*.
- London (2019). The right to play: Eliminating the opportunity gap in elementary school recess. Phi Delta Kappan.
- OPTIONAL: Heissel, Levy, Adam (2017). Stress, sleep, and performance on standardized tests: Understudied pathways to the achievement gap. *AERA Open*.

Class 17 - Tuesday, October 28 - #16

SCHOOL ENTRY

- Vermeer & Groeneveld (2017). Children's physiological responses to childcare. *Current opinion in psychology*.
- OPTIONAL: Parent, Lupien, Herba, Dupéré, Gunnar, & Séguin (2019). Children's cortisol response to the transition from preschool to formal schooling: A review. *Psychoneuroendocrinology*.

Class 18 - Thursday, October 30 - #17

PEERS & NEIGHBORHOODS

- Prinstein & Giletta (2020). Future directions in peer relations research. *Journal of Clinical Child & Adolescent Psychology*.

Class 19 - Tuesday, November 4 - #18

PUBERTY & REPRODUCTIVE HORMONES

- Pfeifer & Allen (2021). Puberty initiates cascading relationships between neurodevelopmental, social, and internalizing processes across adolescence. *Biological Psychiatry*.

Class 20 - Thursday, November 6 - #19

WORKSHOP #3

RESEARCH PROPOSAL FIRST DRAFT DUE

In class, we will do more peer feedback & revisions.

NO CLASS - Tuesday, November 11 - Veterans' Day

Class 21 - Thursday, November 13 - #20

BIOLOGICAL SENSITIVITY TO CONTEXT - PEER FEEDBACK DUE

- Ellis & Boyce (2008). Biological sensitivity to context. Current directions in psychological science.
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Class 22 - Tuesday, November 18 - 📅 #21

APPLIED SCIENCE

- Obradović & Armstrong-Carter (2020). Addressing educational inequalities and promoting learning through studies of stress physiology in elementary school students. Development and Psychopathology.

Class 23 - Thursday November 20 - 📅 #22
WORKSHOP #4

Class 24 - Tuesday, November 25 - CLASS ONLINE
WRAP UP

NO CLASS - Thursday, November 27 - Happy Thanksgiving!

Class 25 - Tuesday, December 2
STUDENT PRESENTATIONS
FINAL RESEARCH PROPOSAL DUE

Class 26 - Thursday, December 4 -
STUDENT PRESENTATIONS

Academic Integrity and Artificial Intelligence.

Academic integrity is a core value of Tufts University. As an instructor, I am required to report instances of plagiarism to the university. If you have questions about what constitutes plagiarism please meet with me, your academic advisor, or the writing/learning center. I will use software such as [“Turnitin”, provided by Tufts University](#), to detect plagiarism. The purpose of this policy is to encourage your own learning and to make the course fair for all students and your peers. Please [read more about Turnitin software here](#) and [about academic integrity at Tufts University here](#).

Artificial Intelligence. In this class, you may use AI **only** to locate research papers that you will reference or learn from. You may not use AI to write or generate any content. There is no test in this class, so this is a strict policy to ensure that you are using your brain and learning. For the assignments, you must also include an AI statement indicating if you used AI, and if so. Any queries “e.g., find me papers about...” must be copied word for word into this AI statement you submit (i.e., you must tell me all the queries you use in an AI). See the “assignment document” for more details. Any use of AI beyond these stipulations is considered plagiarism for this course.

Additional Student Resources:

Accommodations for Students with Disabilities: Tufts University values the diversity of our students, staff, and faculty and recognizes the important contribution each student makes to our unique community. Tufts is committed to providing equal access and support to all qualified students through the provision of reasonable

accommodations so that each student may fully participate in the Tufts experience. If you have a disability that requires reasonable accommodations, please contact the StAAR Center at StaarCenter@tufts.edu or [617-627-4539](tel:617-627-4539) to make an appointment with an accessibility representative to determine appropriate accommodations. Please be aware that accommodations cannot be enacted retroactively; planning is crucial.

Academic Support at the StAAR Center offers free services and resources to all students. Students may make an appointment to work on any writing-related project or assignment, attend subject tutoring in a variety of disciplines, or meet with an academic coach to hone fundamental academic skills like time management or overcoming procrastination. Make an appointment by visiting the [StAAR Center](#) website.

Mental Health Support: As a student, there may be times when personal stressors or emotional difficulties interfere with your wellbeing or academic performance. I'm happy to talk to you about any emotional challenges you face. The Counseling and Mental Health Service (CMHS) also provides confidential consultation, brief counseling, and urgent care at no cost for all Tufts students who have paid the student health fee. To schedule, call 617-627-3360 or visit [CMHS](#) website.